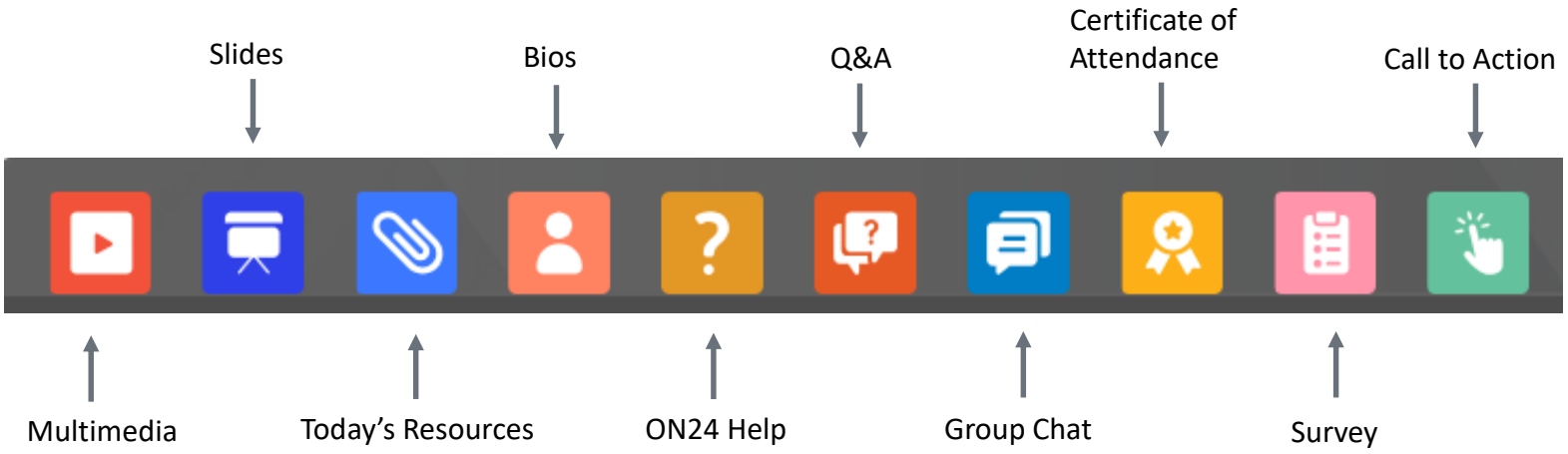
CompTIA Network+ N10-009 TTT Session 10:

Title

July 25, 2024

CompTIA

@TeachCompTIA #NetworkPlusTTT



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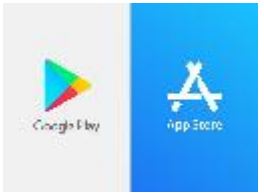

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WORKSHOPS

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Join us for the morning session from 9:00 a.m. to 12:00 p.m. or
the afternoon session from 1:00 p.m. to 4:00 p.m.
Each session is $99.00.
Lunch and refreshments provided

Workshop sessions:

1. Get In Sync with the new CompTIA Tech+ FC0-U71
2. Teaching CompTIA Network+ N10-009 with the new CertMaster Perform
3. Tools for teaching CompTIA A+ 1100 Series

Each session provides:

- Access to official CompTIA content for the course
- Instructor led training and labs
- Certificate of completion provided at the end of session.

Hyatt Regency Atlanta
July 31 – August 1
Register today: https://connect.comptia.org/partnersummit/home

If a bad organizational culture eats ethics for breakfast, then will AI steal your lunch money?

What: One-hour webinar investigating current industry AI trends
When: Thursday July 25th 10:00 a.m. CST
Where: ON24
Who: James Stanger, Chief Technology Evangelist
Register: https://bit.ly/CINPulse-AITrends

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COMING SOON
STAY TUNED!

CompTIA DataX

Complimentary Webinar Series for Instructors

What: 10-session webinar series
When: Aug 12 – Sept 11, 2024
Where: ON24

The CompTIA DataX DY0-001 TTT series will cover:

- DataX exam domains
- Comprehensive understanding of key data science concepts
- Hands-on experience with key technology tools used by data science professionals
- Instructional strategy to implement a DataX course
- Preparation for DataX DY0-001 certification

Network+ N10-009 TTT Session Outline	
Date	Topic
✓ 06/20/2024	Introduction and Network Topologies
✓ 06/25/2024	Cabling and Physical Installations
✓ 06/27/2024	Configuring Interfaces and Switches
✓ 07/02/2024	Configuring Network Addressing
✓ 07/09/2024	Configuring Routing and Advanced Switching
✓ 07/11/2024	Network Security
✓ 07/16/2024	Network Security (Continued)
✓ 07/18/2024	Wireless Networking
✓ 07/23/2024	Troubleshooting and Management
✓ 07/25/2024	Emerging Technologies and Trends

SUMMARIZING CLOUD CONCEPTS

Learning Objectives

Explain datacenter and storage network architecture.

Summarize cloud concepts.

Summarize the use of software, coding, and zero trust in modern network environments.

Datacenter and Storage Networks

Datacenter Network Design

Components of Modern Datacenter Network Design

Virtualization: Agile and scalable networks

Overlay Networks: Secure, flexible server-to-server traffic

Zero Trust Architecture: Authentication/authorization for each request

High Availability features: Networking, power, climate, and access control for reliability

Understanding Traffic Flows: North-South vs. East-West

North-South Traffic: External client access to datacenter resources

East-West Traffic: Server-to-server communication within datacenter

Security and performance challenges: Need for advanced security
and efficient traffic management

Spine and Leaf Topology

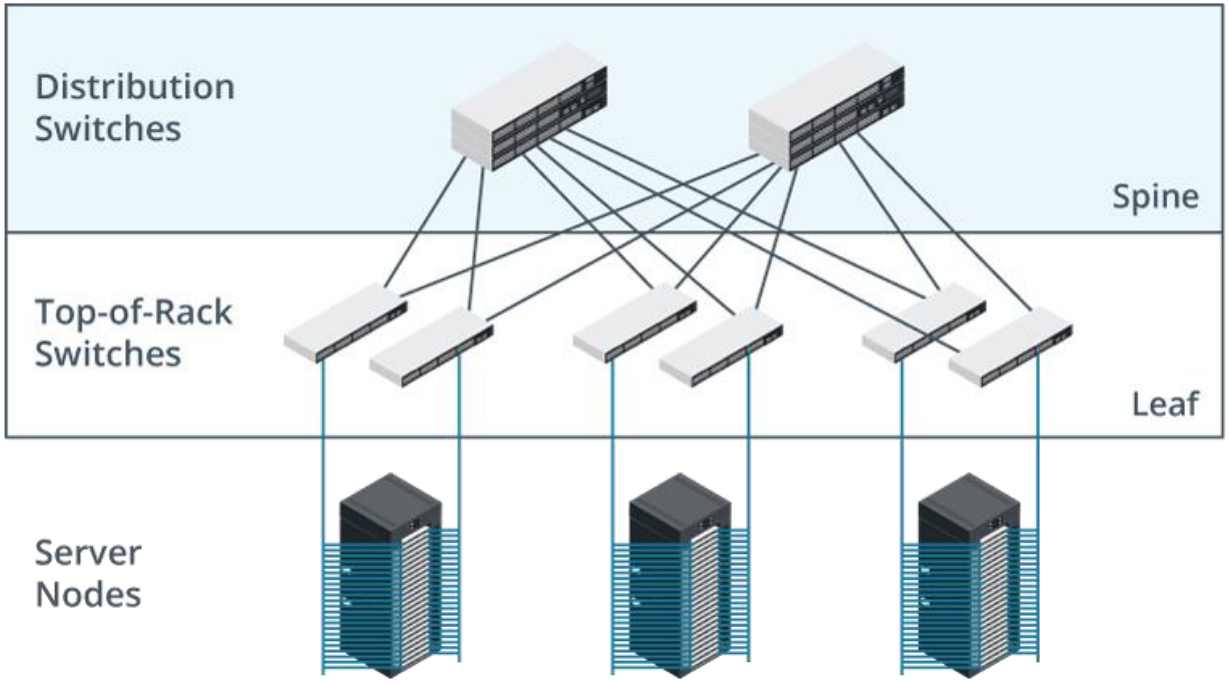
•Spine and Leaf Topology

- Two-layer network topology for optimized data center traffic flow

•Structure

- **Spine Layer**
  - Backbone containing top-tier distribution switches
  - Spine switches interconnected with all leaf switches but not with each other
- **Leaf Layer**
  - Includes access switches that connect to every spine switch in a full mesh topology
  - Facilitates direct paths from devices to the network backbone without inter-leaf switch connections

Spine and Leaf Topology Example



Benefits of Spine and Leaf Topology

•Predictable Latency

- •Single hop from any server to the backbone
- •Ensures consistent network performance

•Load Balancing and Failover

- •Multiple redundant paths between leaf and spine
- •Allow for effective load distribution and reliability

•Loop-Free Design

- •Non-interconnected spine and use of ECMP on leaf switches
- •Eliminates need for Spanning Tree Protocol

•Scalability and Redundancy

- •Easy to scale by adding more spine or leaf nodes without topology changes
- •Servers connect to multiple leaves for redundancy

•High-Speed Connectivity

- •Top-of-Rack (ToR) switches at the leaf layer provide high bandwidth connections to servers
- •Support modern data-intensive applications

Storage Area Network (SAN)

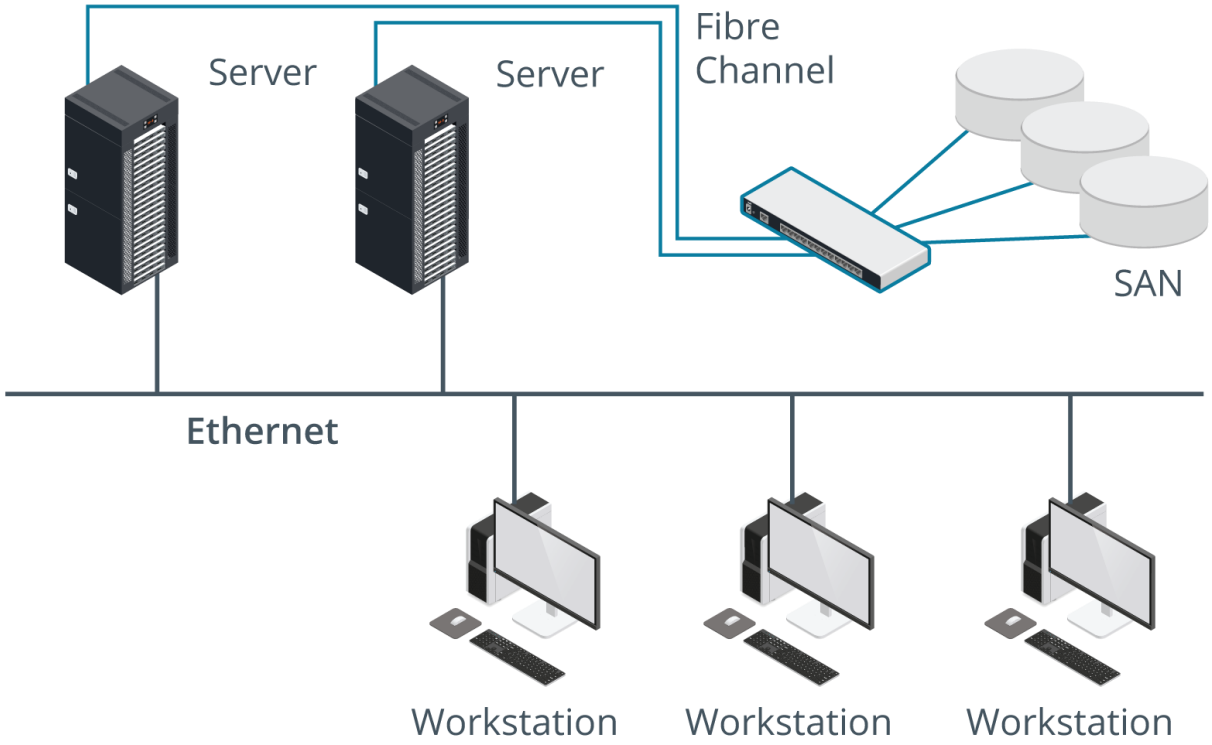
•Storage Area Network (SAN)

- A network dedicated to providing access to consolidated, block-level data storage
- Separates storage resources from the local network

•Components of a SAN

- Storage devices (RAID arrays, tape libraries)
- SAN Fabric (Switches and directors that connect servers with storage devices)
- SAN Software (Management and configuration tools)

SAN Example


Server
Server
Fibre
Channel
SAN
Ethernet
Workstation
Workstation
Workstation

Storage Area Network (SAN)

•Benefits of a SAN

- High Availability
- Scalability
- Minimized latency and maximized throughput

•Use Cases

- Database management
- Business continuity
- Cloud storage

Fibre Channel (FC)

Defined

- High-speed data transfer protocol
- Backbone for SANs
- British spelling “fibre” to distinguish from fiber optic cables

Components

- Initiators (servers with a host bus adapter)
- Targets (storage device ports)
- FC switches (facilitate data transfer)

Advantages

- Performance
- Flexibility
- Speed
- Quality of Service (QoS) mechanisms

Poll Questions

- What are the key components of modern datacenter network design?
- How does a spine and leaf topology differ from traditional network architectures, and what are its benefits?

Game: "Datacenter Design Challenge"

- Arrange the following components in the correct order to build an efficient datacenter network, from the core to the edge:

1. Spine switches
2. Servers
3. Leaf switches
4. Internet connection

Cloud Concepts

Scalability in Cloud Computing

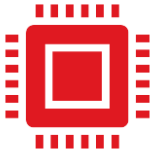
Definition	Capability of a cloud computing system to handle growing amount of work Cloud system grows with your needs: Handles increasing workloads
Types	Horizontal Scaling (Scaling Out/In) Vertical Scaling (Scaling Up/Down)
Benefits	Flexibility Performance
Examples	Scale servers for anticipated surge in web traffic (product launch) Upgrading server specifications to support more intensive compute tasks

Elasticity in Cloud Computing

Definition

Ability of a system to automatically adjust and allocate computing resources on demand

Ensures optimal performance despite fluctuations in usage



Key Features

Automatic Scaling

Cost-Effectiveness (pay what you use)

Real-Time Responsiveness

Examples

Auto-scaling web application servers during a traffic spike

Decreasing allocated resources overnight when demand is lower to reduce costs

Cloud Deployment Models

Model	Description	Pros	Cons
Public Cloud	Shared resources over the Internet by CSPs	Cost-effective, pay-as-you-go financing, subscriptions	Higher risks in performance and security
Hosted Private Cloud	Exclusively used by one organization, hosted by a third party	More secure, better performance	More expensive
Private Cloud	Owned and operated by the organization	Greater control over privacy and security	Best for services requiring strict access control
Hybrid Cloud	Mixes public and private cloud solutions	Flexibility to scale; balances security and cost	Complexity in managing multiple environments

Cloud Service Models

Infrastructure as a Service (IaaS)

Provides virtualized computing resources over the internet

Examples: AWS EC2, Microsoft Azure Virtual Machines, OpenStack

Software as a Service (SaaS)

Delivers software applications over the internet (subscription basis)

Examples: Microsoft Office 365, Salesforce, Google Workspace

Platform as a Service (PaaS)

Hardware and software tools over the internet, typically for application development

Examples: Oracle Database, Microsoft Azure SQL Database, Google App Engine

Advantages of Cloud Service Models

Scalability and Flexibility	Scale resources up or down based on demand without the need for physical hardware changes
Cost Efficiency	Pay only for the computing resources you use
Speed and Efficiency	Deploy and manage applications faster without the need to set up and maintain physical servers
Accessibility and Collaboration	Access your applications and data from anywhere

Activity: What Would You Do?

- Imagine you are the CTO of a growing tech startup that manages sensitive financial data for clients worldwide. You're deciding on the most suitable cloud deployment model to optimize your operations while adhering to strict data privacy laws and regulatory compliance.

- Your options include adopting:
- A public cloud for its scalability and cost-effectiveness
- A hosted private cloud for its enhanced security features
- A fully private cloud for ultimate control and privacy
- A hybrid model that combines the benefits of both public and private clouds to meet your specific operational and regulatory needs.

- Given the critical nature of the data and the need for scalability as your startup grows, which deployment model would you choose to ensure the best balance of security, compliance, flexibility, and cost?

Poll Questions

- What are the main differences between scalability and elasticity in cloud computing?
- Compare and contrast the different cloud deployment models (public, private, hosted private, and hybrid).

Cloud Networking

Cloud Instances

Types of Cloud Instances

Virtual Machines (VMs): Fully-fledged servers with emulated hardware, can run an OS and multiple applications

Containers: Isolated environments for running applications (lightweight & portable)

Virtual Appliances: Pre-configured VMs/containers (emulating hardware functions)

Advantages of Cloud Instances

Flexibility and Scalability: Easily resized and scaled; no physical hardware changes

Cost-Effectiveness: Scale costs with resource usage

Rapid Deployment: Fast provisioning; minutes to deploy & configure instances

Comparing Cloud Instances

•Virtual Machines (VMs)

- •Run multiple OSs on a single hardware platform
- •Complete isolation from the host system (secure and stable operations)
- •Higher resource consumption due to emulation of hardware

•Virtual Appliances

- •Pre-built software packages for tasks like firewalls, ready to run
- •Optimized to use resources more efficiently than general-purpose VMs for specific tasks
- •Can be easily deployed across diverse cloud environments

•Containers

- •Shares the host system's kernel, reducing overhead significantly
- •Easier to scale and manage due to their small footprint
- •Designed to run a single application or service for performance and portability

Virtual Private Clouds

Virtual Private Clouds (VPCs)

- Serve as isolated environments within a public cloud
- Enable organizations to run their applications securely

Key Features

- Each VPC is isolated from other tenants in the cloud
- Tenants can configure their virtual network
- Offer multiple layers of security controls, including security groups and ACLs

Use Cases

- Application Hosting
- Hybrid Cloud Environments
- Customization and Flexibility
- Networking Across Clouds

Cloud Firewall Security

Cloud Firewall Security

Acts as a barrier between cloud resources/external threats

Enforces security rules to allow or block traffic

Functions

Segmentation for performance and compliance

Filters traffic based on OSI model layers

OSI Layers Explained

Layer 3 (Network): IP addresses and TCP/UDP ports filtering

Layer 4 (Transport): Stateful inspection of connections

Layer 7 (Application): Parsing protocol headers for content-based filtering

Implementing Cloud Firewall Solutions

•Implementation Options	•Considerations	•Benefits of Cloud Firewalls	•Cost vs. Efficiency
• Host-based software on instances • Service at the virtualization layer	• Software-based solutions consume resources • Management complexity with multiple instances	• Scalable and flexible security management • Facilitates compliance with data protection laws	• Analysis of transaction costs for cloud firewalls • When to consider third-party firewall services

Security Groups

Definition

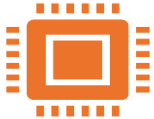
A security group acts as a virtual firewall for instances to control inbound and outbound traffic

Functionality

Operates at the instance level

Provides stateful filtering

Allows specifying allow rules, but all unmatched traffic is dropped



Key Points

Multiple security groups can be assigned to a single instance

Customization allows for specific ports and IP ranges to be defined for access

Restricting traffic based on protocol, port numbers, and source/destination IP addresses

Activity: Matching

- Fully-fledged servers with emulated hardware, capable of running an operating system and multiple applications
- Lightweight, used for running single applications or processes with minimal overhead
- Pre-configured; often used for emulating specific hardware functions like routers or firewalls

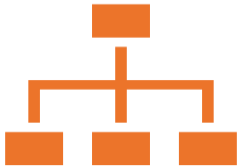
Containers

Virtual Machines

Virtual Appliances

Modern Network Environments

Infrastructure as a Code



Infrastructure as a Code (IaC)

Management of IT infrastructure through machine-readable definition files

Uses code to manage and provision the IT infrastructure automatically and safely

Enables quick, consistent, and cost-effective deployment of applications across various environments

Benefits

Consistency and efficiency

Speed and scalability

Version control and collaboration

Tools for Infrastructure as a Code

•Terraform

- Allows for declarative coding to provision and manage any cloud, infrastructure, or service

2.Ansible

- Uses a declarative language to automate deployment, configuration, and orchestration tasks

3.Chef

- Uses recipes and cookbooks to apply configurations across environments

4.Puppet

- Uses a declarative approach to automate infrastructure management

AWS Cloud Formation

- Allows you to use programming languages or a simple text file to model and provision all the resources needed for your applications

Use Cases for Infrastructure as a Code

•Automating Deployment	2.Consistency & Speed	3.Efficient Upgrades	4.Dynamic Inventory Management
• Rapidly deploy VMs and containers to various cloud environments with minimal manual intervention	• Use master images or templates for consistent and fast provisioning of infrastructure	• Streamline the upgrade process of OS and software versions	• Keep track of cloud instances through dynamic inventories

Source Control

Source Control

- Method to manage and track code changes in software development
- Essential for collaborative projects and maintaining code integrity

Components

- Version control
- Central repository
- Branching
- Conflict identification

Benefits of Source Control

- Enhances collaboration among developers
- Facilitates efficient management of code changes
- Maintaining a history of project changes and revisions

Software-Defined Networking (SDN)

•Definition

- Simplifies network management by separating control and forwarding functions
- Allows direct programmability of network control and abstraction of the infrastructure for applications and services

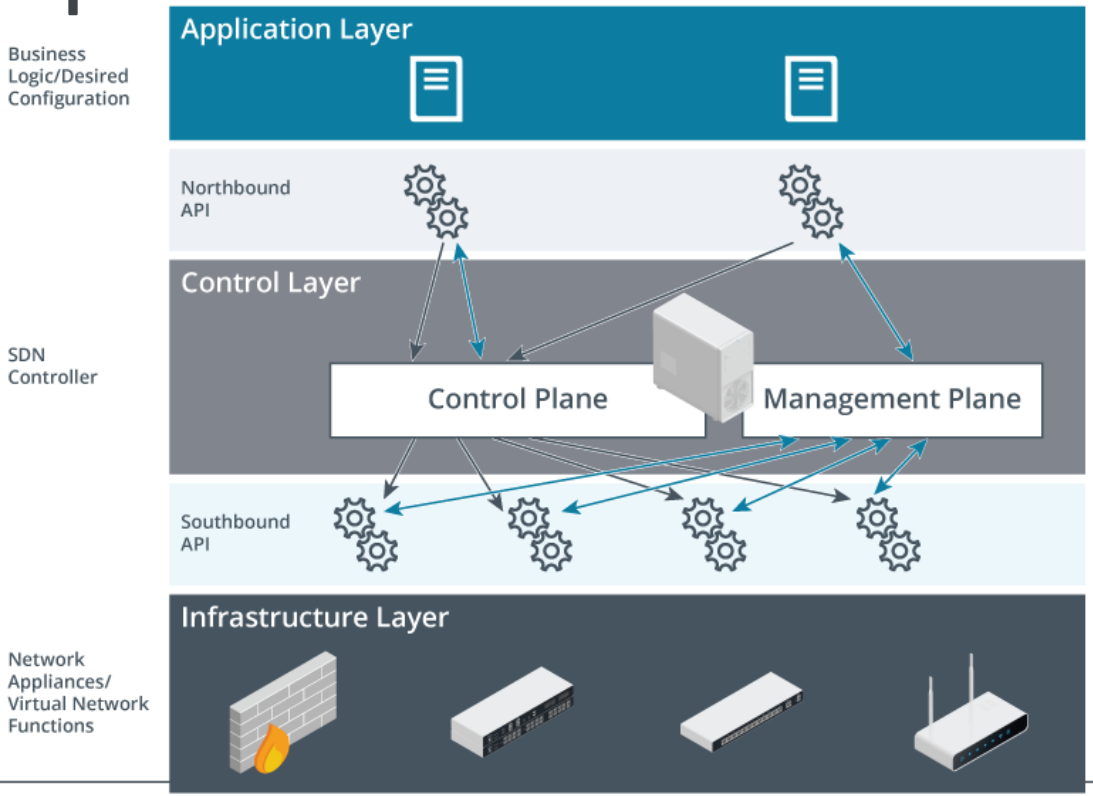
•Components

- SDN Controller (Brain of the network)
- Southbound APIs (Communication between controller and devices)
- Northbound APIs (Interface between controller and the business applications)

•Benefits

- Enhanced network agility and flexibility
- Simplified network management
- Improved network efficiency and performance

SDN Example


Business Logic/Desired Configuration
Application Layer
Northbound API
SDN Controller
Control Layer
Control Plane
Management Plane
Southbound API
Infrastructure Layer
Network Appliances/ Virtual Network Functions

SDN Use Cases

•Network Virtualization

- Creating multiple virtual networks with distinct security policies and functions over a single physical infrastructure

•Cloud Computing

- Dynamically adjusting network resources to meet the demands of cloud services, improving scalability and reducing operational costs

•Data Center Management

- Automated provisioning and management of network resources, enhancing data flow efficiency and reducing latency

•IoT (Internet of Things):

- Managing the massive and diverse traffic from IoT devices for reliable connectivity and security at scale

Game "Cloud Match-Up" Match the cloud deployment model with its best use case:

1. Public Cloud
2. Private Cloud
3. Hybrid Cloud

- A. A government agency handling sensitive data B. A small business looking for cost-effective IT solutions C. A healthcare provider balancing data privacy with scalability needs

Summary

Cloud Strategy: Evaluate cloud apps & services: Choose deployment model (public, private, hybrid) & service type (IaaS, SaaS, PaaS, DaaS) for optimal scalability & elasticity.

Cloud App Development: Leverage IaC for automation and leverage SDN benefits.

Private Cloud/Datacenter: Virtualization & SAN for enhanced elasticity & scalability. Integrate with SDN & NFV.

Public Cloud Security: Define Cloud Responsibility Matrix, conduct regular risk assessments & security audits.

Discussion time: Please type your questions in chat

- Questions over content.
- Share you experience.
- What would you like to see different moving forward?

Let’s keep the conversation going in the CompTIA Instructor Forum: https://cin.comptia.org